

UDC 532.783

Aleksandra Gridyakina¹
Arkadiy Polishchuk²**STRUCTURAL CHARACTERISTICS OF MESOPHASES
AND MESOMORPHIC GLASSES OF METALALKANOATES**National Aviation University
Kosmonavta Komarova avenue 1, 03680, Kyiv, Ukraine
E-mails: ¹morhin@ukr.net; ²ark.nau@gmail.com

Abstract. *The structure of the mesophases and mesomorphic glasses of cobalt alkanoates homologous series was obtained. It is shown, that typical for ITLC smectic A packing of molecules (cation-anion layer between layers alkanoate chains) preserves also in a glass phase (at room temperature).*

Keywords: cobalt alkanoates; ionic thermotropic liquid crystals; mesomorphic glasses; mesophase structure; method of X-ray small-angle scattering.

1. Introduction

Searching for and investigation of new materials, which can be perspective for developing and establishing of information storage and processing devices, is one of the important areas of modern science.

As a result, much attention is paid to the investigation of alternative classes of Liquid Crystals (LC) recently.

Unusual properties of these materials open up new opportunities for a variety of practical applications.

The melting point and mesophase existence interval are very important because of practical application which require LC materials with low melting points and ability to exist at room temperature in the LC glass state.

2. Analysis of research and publications

Salts of alkane acids $C_nH_{2n+1}COOM$ form Thermotropic Ionic LC (TILC) during melting.

TILC exhibit high ionic conductivity, wide interval of mesophase existence, high thermal stability and ability to vitrification [7].

However, their use as new functional materials is often limited by high melting points [3, 7].

Decrease the melting temperature is observed for multicomponent LC systems, which include two, three or more individual compounds of approximately the same chemical nature.

Aim of the work is:

- investigation of the cobalt alkanoates structure depending on temperature and phase state;
- development of molecules packing model in the crystal, liquid crystal and glass states.

3. Methods and objects of research

The X-ray small-angle scattering study was conducted for establishing the nature of the molecules arrangement and its changes during phase transformations for samples of cobalt octanoate

$(C_7H_{15}COO^-)_2Co^{2+}$ ($T_{melt} = 93^\circ C$, $T_{clar} \approx 164^\circ C$),
cobalt decanoate

$(C_9H_{19}COO^-)_2Co^{2+}$ ($T_{melt} = 82^\circ C$, $T_{clar} > 300^\circ C$)
and lead decanoate

$(C_9H_{19}COO^-)_2Pb^{2+}$ ($T_{melt} = 87^\circ C$, $T_{clar} = 114^\circ C$),
binary mixture

$Pb^{2+}, Co^{2+} | (C_9H_{19}COO^-)_2$ (60:40 mol. % correspondingly, $T_{melt} = 83^\circ C$, $T_{clar} = 92^\circ C$),
cobalt laurate

$(C_{11}H_{21}COO^-)_2Co^{2+}$ ($T_{melt} = 88^\circ C$, $T_{clar} > 300^\circ C$).

Measurements were carried out with small-angle diffractometer with a slit collimation system.

The studies were carried out on the experimental setup with monochromated $CuK\alpha$ -radiation of X-ray tube with capacity of 1,2 kV, monochromator - nickel foil, focused spot size of 0,4x8 mm.

Range of 2θ angles – from $0,1^\circ$ to 20° , resolution of collimation system was $0,02^\circ$.

The temperature was measured by copper-constantan thermocouple, with an accuracy of $0,2^\circ C$. Measurements were carried out in the direction of growth temperature and towards its reduction.

**4. X-ray investigation of lead decanoate
 $(C_9H_{19}COO^-)_2Pb^{2+}$**

Research of lead decanoate compound in the crystalline state (temperature range $30-80^\circ C$)